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minism and free will does not exist for the naturalist—not because he doubts his freedom and responsibility, but because he knows nothing of determinism.

We cannot be surprised that some students of science should confuse their reasonable expectations that the future will, on the whole, be essentially like the past with belief that it must so be, when we remember how often they have been told by philosophers like Ward that the scientific conception of the mechanism of nature is the conception of 'an unbroken and unbreakable mechanism,' which 'absolutely determines' the order of events, and 'banishes spirit and spontaneity,' 'holding all things fast in fate'; although most men of science are now as emphatic as Berkeley in the declaration that naturalism means nothing of the sort. What they assert that it does mean is that we know nothing of 'catastrophes.' As Sir Thomas Browne tells us: "It was the ignorance of man's nature that begat this very name, and by a careless term miscalled the providence of God; for there is no liberty for causes to operate in a loose or careless way."

W. K. BROOKS.

JOHNS HOPKINS UNIVERSITY.

MEDICAL SCIENCES IN THE UNIVERSITY.

TO THE EDITOR OF SCIENCE.—Permit me to call attention to a somewhat inaccurate statement made by Professor Minot in his very interesting address delivered at the Medical Commencement of Yale University and subsequently published in SCIENCE. Professor Minot says: "If a young man wishes to make a scientific career, if his interest is chemistry, physics, botany or zoology, he is received at one of our universities started upon a well-planned course properly systematized, he gives for two or three years most of his strength to his main subject, but he follows probably two cognate subjects as minor studies, and at the end of his time, if successful in his work, he receives a degree, which attests his proficiency in his special science. Should the same young man elect to study one of the medical sciences, physiology, pathology or bacteriology, no university will give him corresponding recognition. The utmost he can find is opportunity for advanced

work in his special subject, but with no university guidance, no plan of correlated studies, and he can look forward to no degree, nor even to a certificate from the university."

In this University, from its foundation in 1876, physiology has been given complete university standing. Its courses are coördinate in every way with those in chemistry, physics, botany or zoology, and many students have offered it, after three or more years of continuous study, as a major subject for the degree of Doctor of Philosophy. The same may be said with regard to pathology and bacteriology.

I speak only for the Johns Hopkins University, but there are other universities in this country in which physiology is also accorded every privilege in the philosophical faculty.

W. H. HOWELL.

JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD.

September 28, 1899.

NOTES ON INORGANIC CHEMISTRY.

OWING to the difficulties in the way of using acetylene on a large scale as an illuminant, and in part perhaps also owing to the opposition raised by those interested in other methods of lighting, the new illuminant has not made the rapid progress predicted for it. Some towns on the continent of Europe, however, have adopted it, as the town of Veszprim in Hungary, and in a recent number of the *Chemiker Zeitung*, Professor J. Vértess gives a paper on some of the drawbacks which attend the use of acetylene. In the first place the calcium carbide from which it is generated is in commerce never pure, but contains at least 20 per cent. of impurities. Theoretically, 350 liters acetylene per kilo carbide should be obtained, but as a matter of fact in practice hardly more than 280 or 290 liters can be depended upon. Again, the carbide contains sulfur, phosphorus and nitrogen, so that we have as impurities in the acetylene, hydrogen sulfide, phosphine and ammonia; hence it follows that acetylene must be purified in much the same way as ordinary coal gas. While burning from an ordinary burner, after a time the flame becomes smoky and carbon is deposited on the burners. This seems to be owing to the burner attaining a temperature higher than that of the decomposition of acetylene. Vértess also

calls attention to another drawback, in occasional fog formed in a closed room where acetylene is used. This he thinks is due to the deposition of carbon as the hydrogen of the acetylene burns, thus creating a sort of mist. It will require some ingenuity to overcome all these difficulties, but we cannot doubt but that it will be accomplished in the near future; as it is, the progress of acetylene has advanced much more rapidly than any other form of artificial illumination.

THE most serious problem in the generation of acetylene on a small scale is the after-formation of gas in the generator. This is discussed by P. Wolff in the *Metallarbeiter*, and reproduced in the *Chemical News*. According to Wolff this after-generation is due to three causes: the action of the residual water contained in the pores of the carbid, the condensation of water on the surface of the carbid, and the absorption of aqueous vapor. In an experiment where the carbid reservoir was over petroleum, the after-generation was 6 liters in 24 hours, 16 liters in three days and remained constant at this figure. Over water 25 liters were given off in one day, and 30 liters in three days. The generation of gas continued at five to six liters a day until the carbid in the generator was completely decomposed. This shows the danger in small generators where there can be no large reservoir. In large apparatus a gas reservoir can be attached which will have capacity to hold this generated gas and that without compression, which would render it dangerous. The best device is spoken of as being that of Münsterberg, which not only has a relatively large reservoir, but a device for closing the carbid chamber by an air-tight valve which completely shuts off the chamber when the apparatus is not in use. No mention is made of the device which has been used in this country, where the carbid is dropped in small lumps into water. As each piece is exhausted a new portion is fed automatically.

PROFESSOR R. STAVENHAGEN, of Berlin, has described in the *Berichte* the properties of tungsten, which have been, heretofore, only imperfectly studied in impure specimens of the metal. The tungsten was obtained by reduction of the

oxide by aluminum. It is found to be practically insoluble in acids, even in aqua regia; it dissolves slowly, however, in fused caustic potash. It is decidedly hard, of a color slightly darker than that of zinc, and is infusible in the electric arc.

ACCORDING to the *Chemical News* of August 18th, Professor Dewar, at the Royal Institution, had just succeeded in obtaining hydrogen as a solid, glassy, transparent mass. Further particulars of this interesting discovery will be eagerly looked forward to.

J. L. H.

THE NEW COLLEGE PRESIDENTS.

ON this subject the *Educational Review* for September comments editorially as follows:

"Four of the most important college presidencies to which we made reference some time ago have been filled, and so satisfactorily filled that it is a matter for rejoicing. It seems to us that Presidents Hadley of Yale, Harris of Amherst, Faunce of Brown, and Wheeler of California were the best selections possible, taking into account the peculiar traditions and problems of each of the four institutions and the personal equation of the man chosen to preside, we hope for at least a quarter of a century, over the teaching body of each. Three of the four men are successful and experienced teachers, and the fourth is a clergyman whose teaching instinct is very strong and whose relations to education have been very close. In these elections the recently exploited newspaper theory that a large college needs a business man or a money getter for President has received a set-back and a severe rebuke. We can imagine few things worse for higher education in the United States than to have the spirit of commercial trading and the business man's point of view obtain strong foothold in it. 'Business methods' have debauched and are debauching politics on every hand, and the treasure house of education must be protected from their inroads at all hazards. The idealism which American life so sorely needs must be furnished in large part by the universities, and the two last questions for their governing boards to be taught to ask are, Is it 'timely'? and, Will it pay?"